Feasibility of laser-induced incandescence for on-road measurements of particulate matter emissions

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Feasibility of Laser-Induced Incandescence for On-Road Measurements of Particulate Matter Emissions

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Particulate Matter Collaboratory

NRC/Artium visit to Sandia, April 2001
(~ 4'x4'x4')

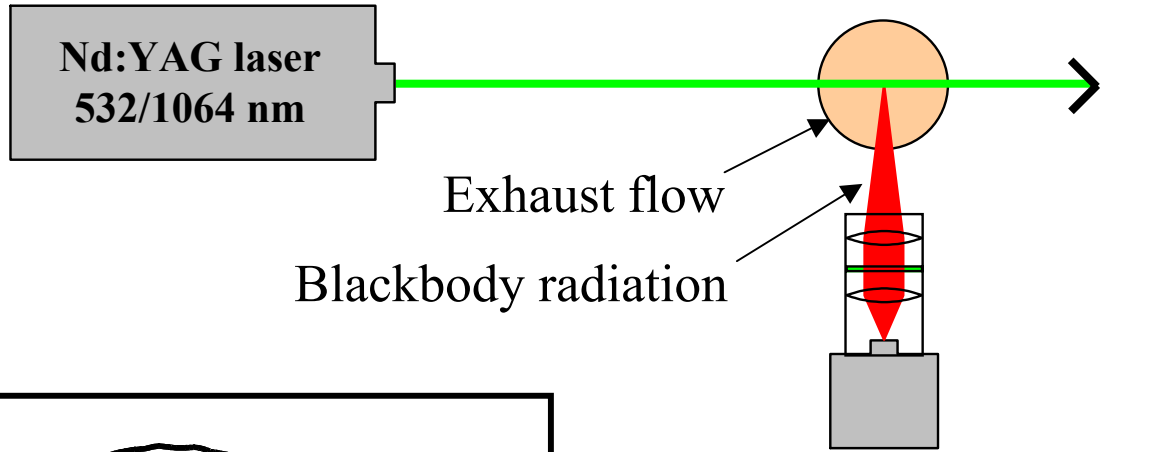
www.ca.sandia.gov/pmc

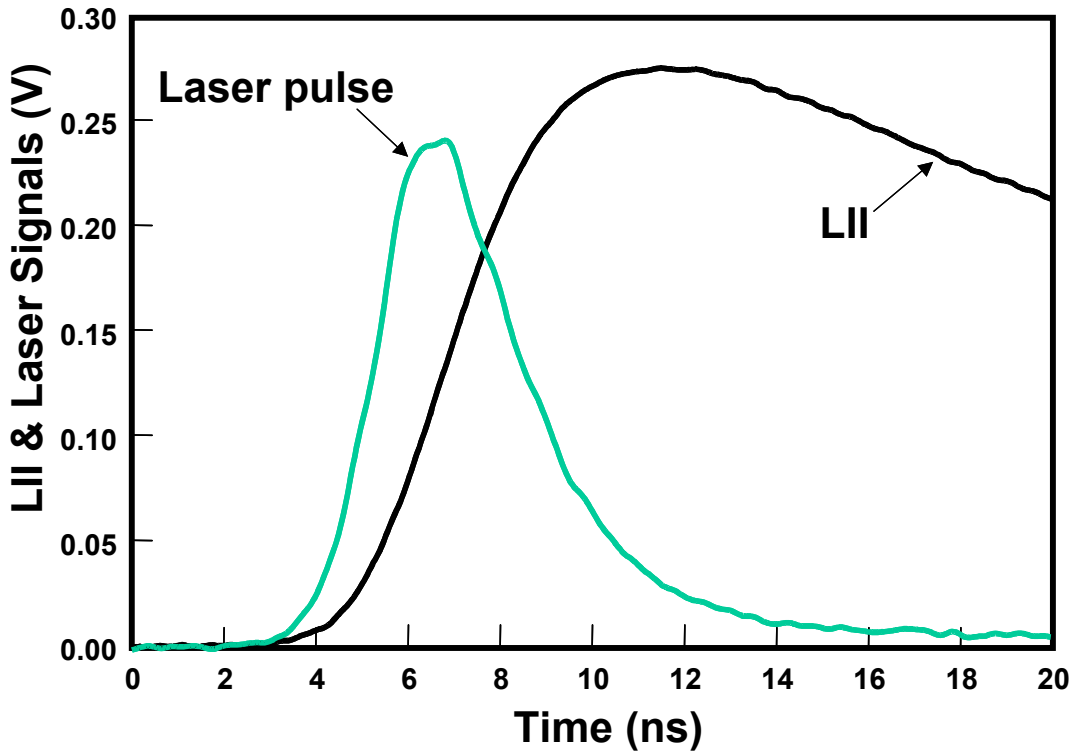
NRC holds a patent for an *in situ* LII calibration procedure that has been licensed to Artium.

Artium has established offsite access to run their instrument at Sandia (by modem) and NRC (by internet).

Sandia and NRC have a joint task with the International Energy Agency for development of laser-based diagnostics for PM emissions from internal combustion engines.

What is LII?

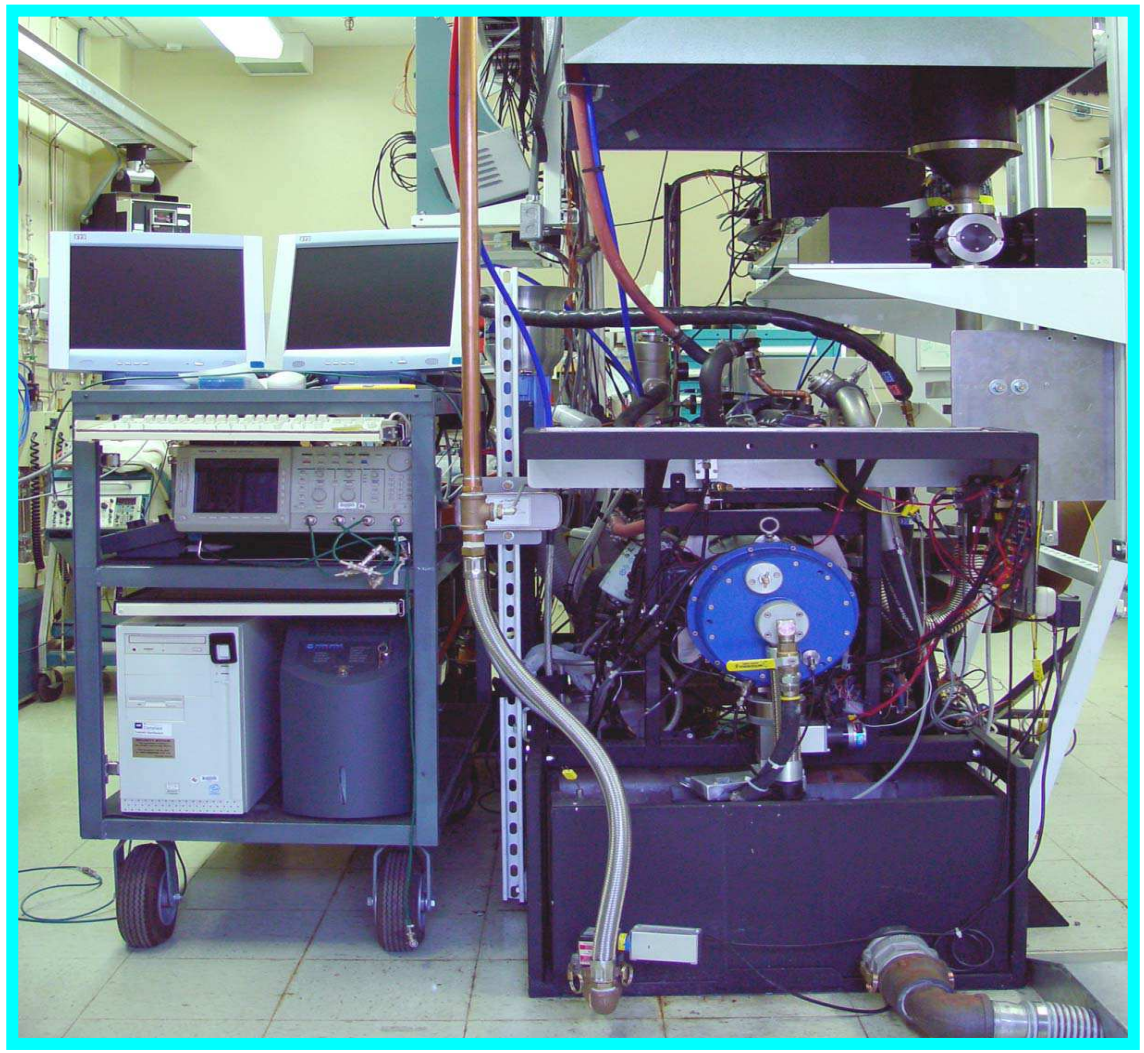




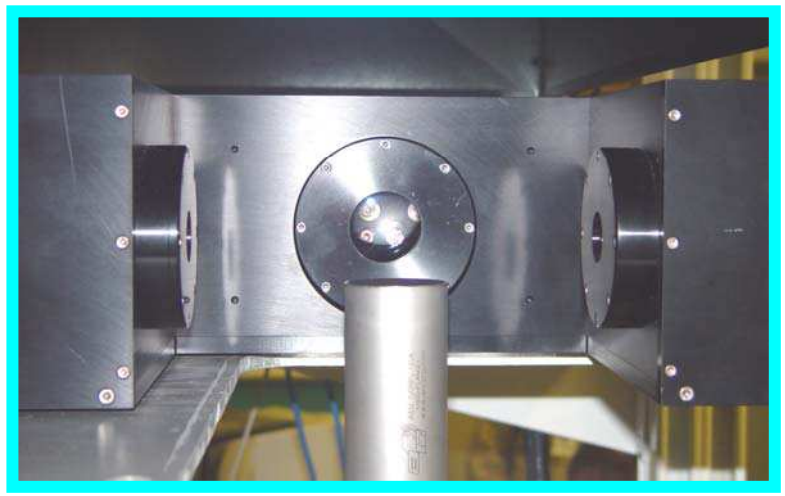
Volume fraction of elemental carbon

$$f_v \propto \mathrm{LII}_{\mathrm{max}}$$

Sandia 1.9L TDI diesel engine lab



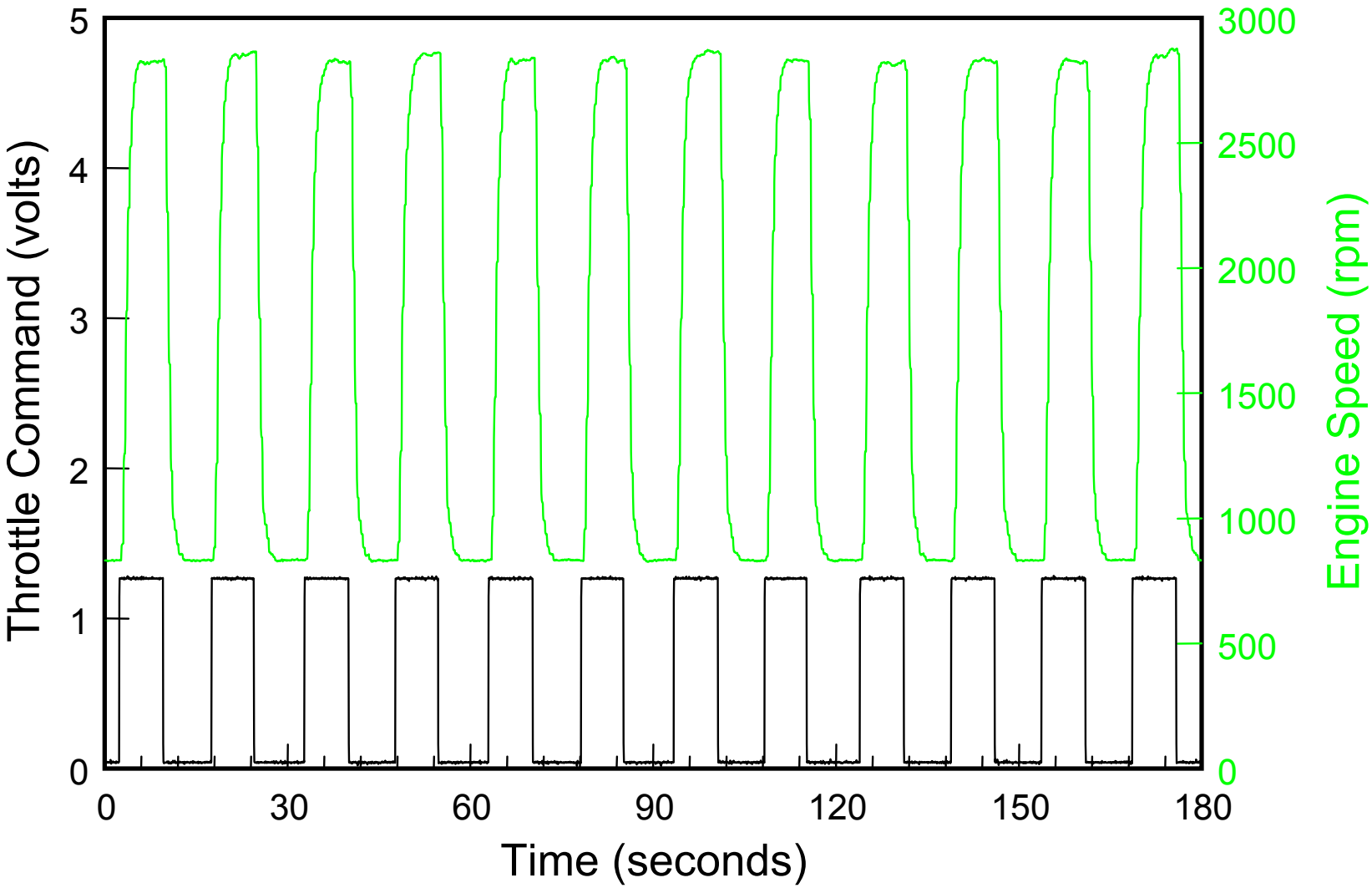
In situ use of Artium LII instrument



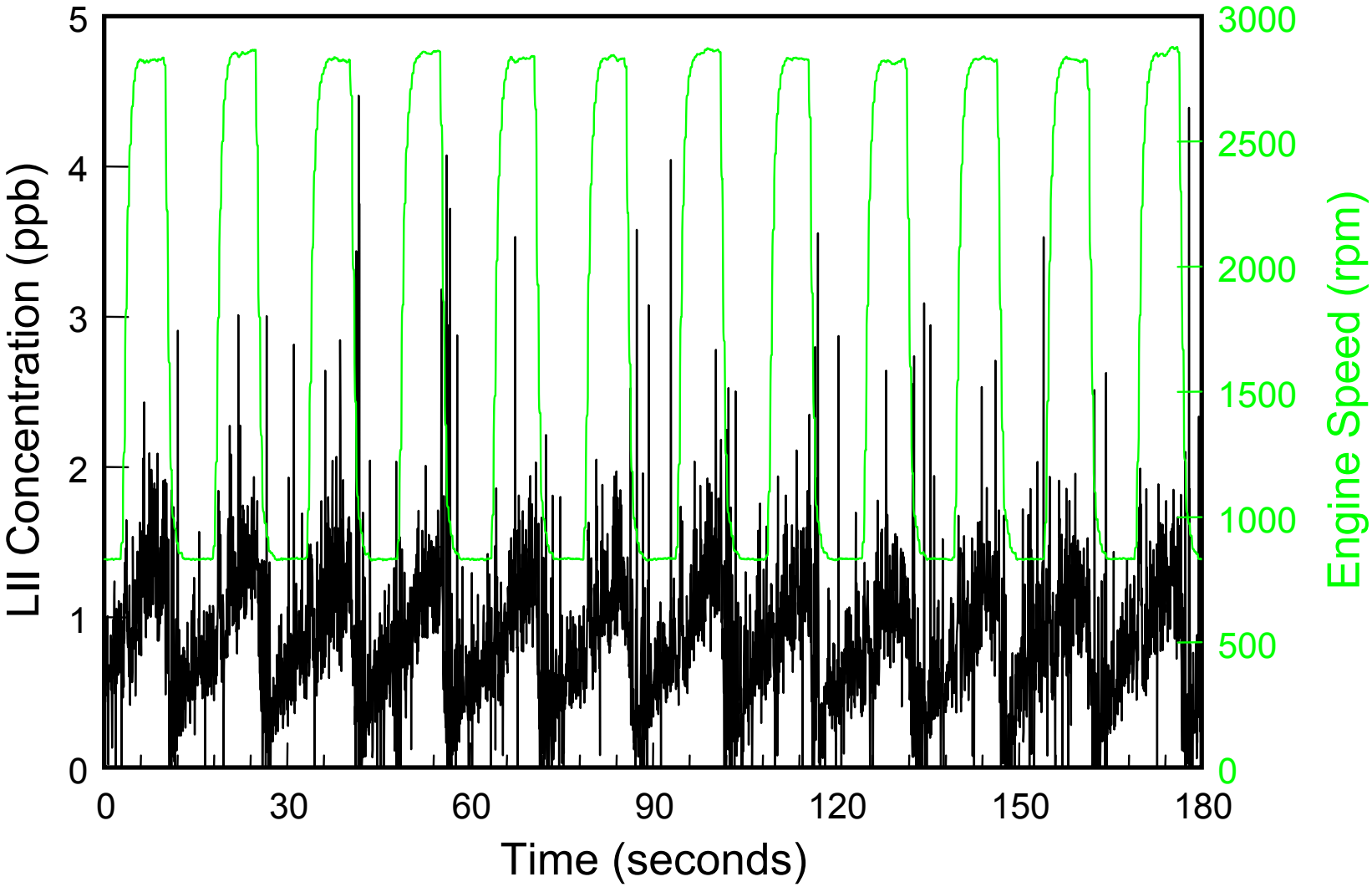
LII 200™ consists of a 50x60x15 cm box that contains the laser, optics, detectors and electronics. All operational functions are controlled by a PC, providing true "turn key" performance.

Extractive sampling for road-side testing

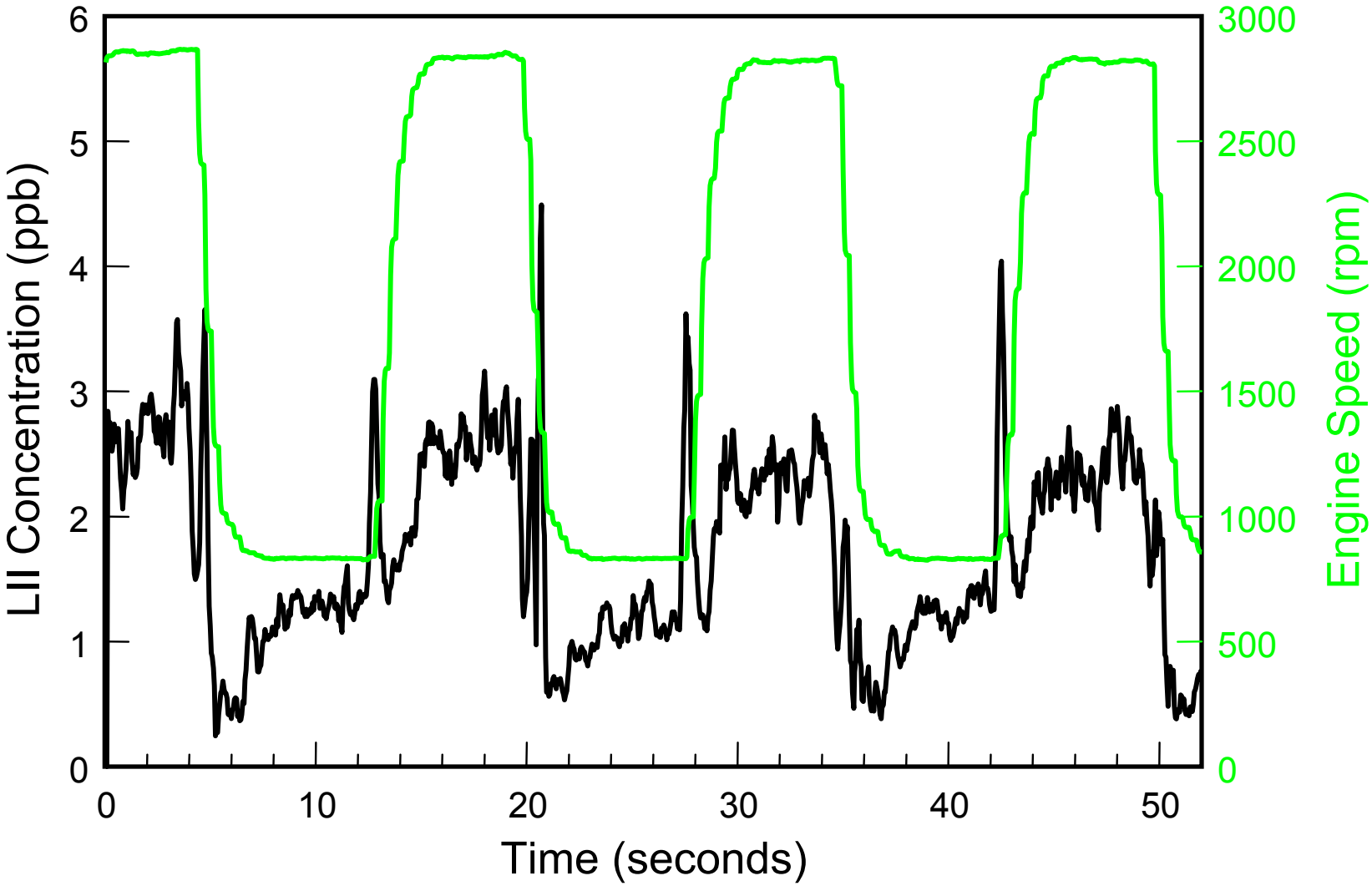
Free acceleration sequence



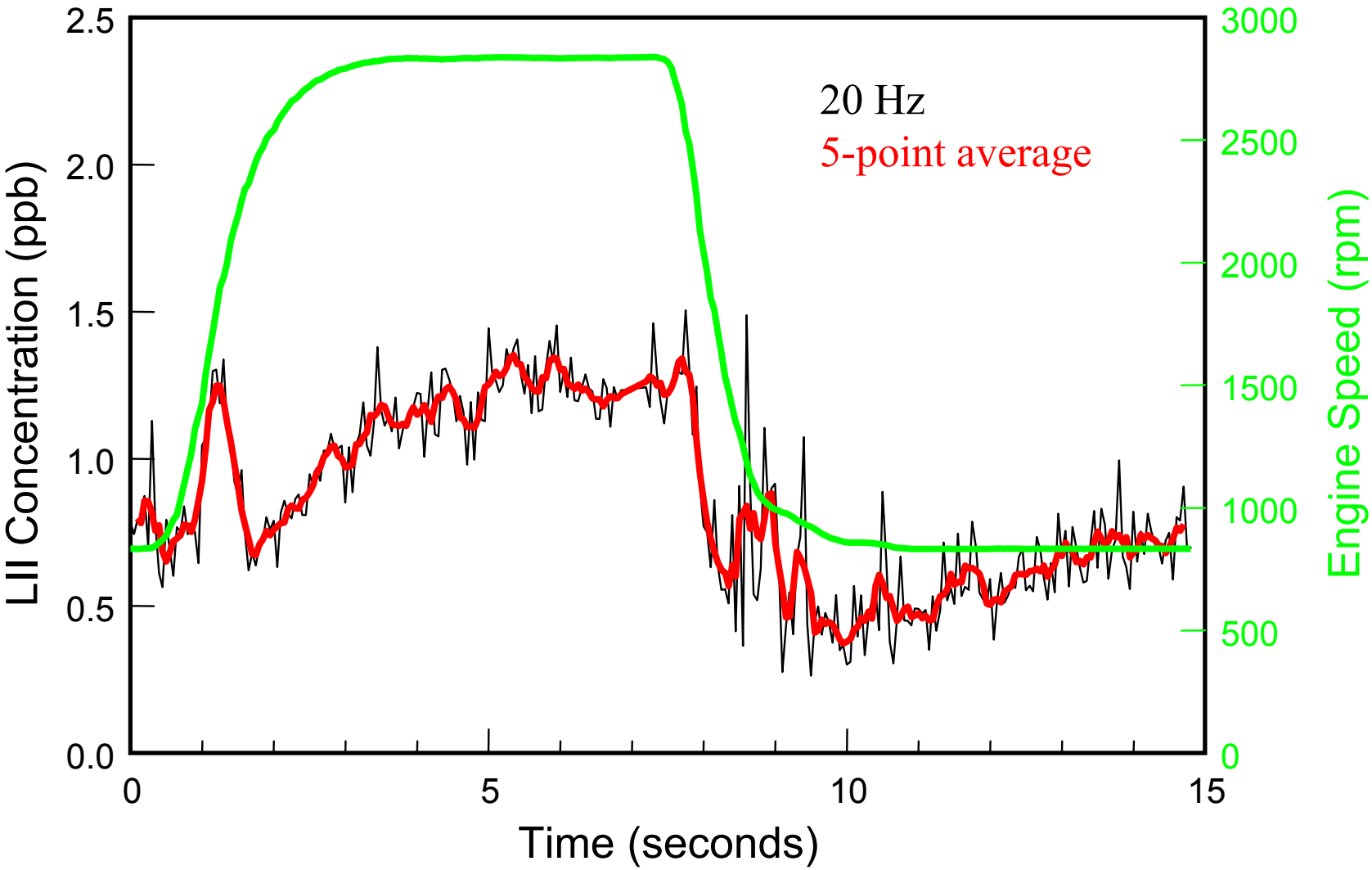
Raw LII data at 20 Hz



Cyclic variations with 5-point smoothing



Effect of ensemble average & data smoothing



Will LII fit on-board?

Sandia “LII-on-a-cart”
2’x4’x5’ 120V/15A
Exhaust tap/vent

Artium “LII-in-a-box-to-be”
Estimate 2’x3’x3’

Gasoline generator
120V/18A
20”x15”x13”

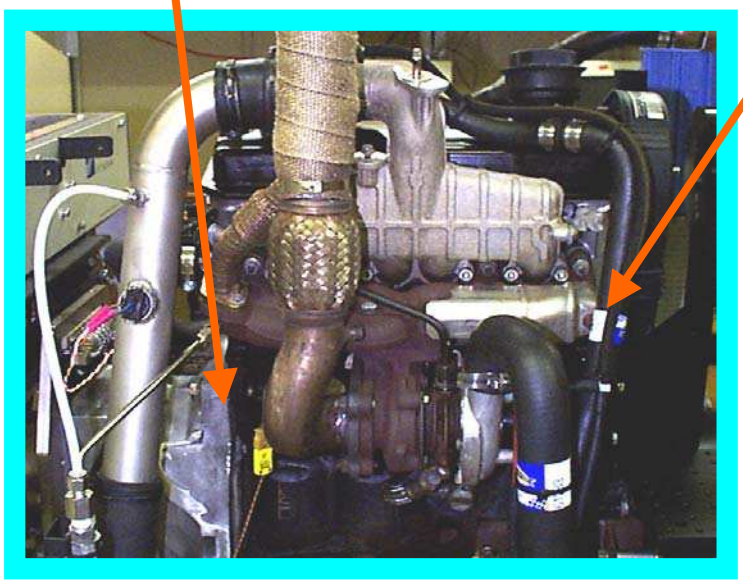
Extractive sampling locations

Tailpipe

After the turbo

#1 cylinder exhaust port

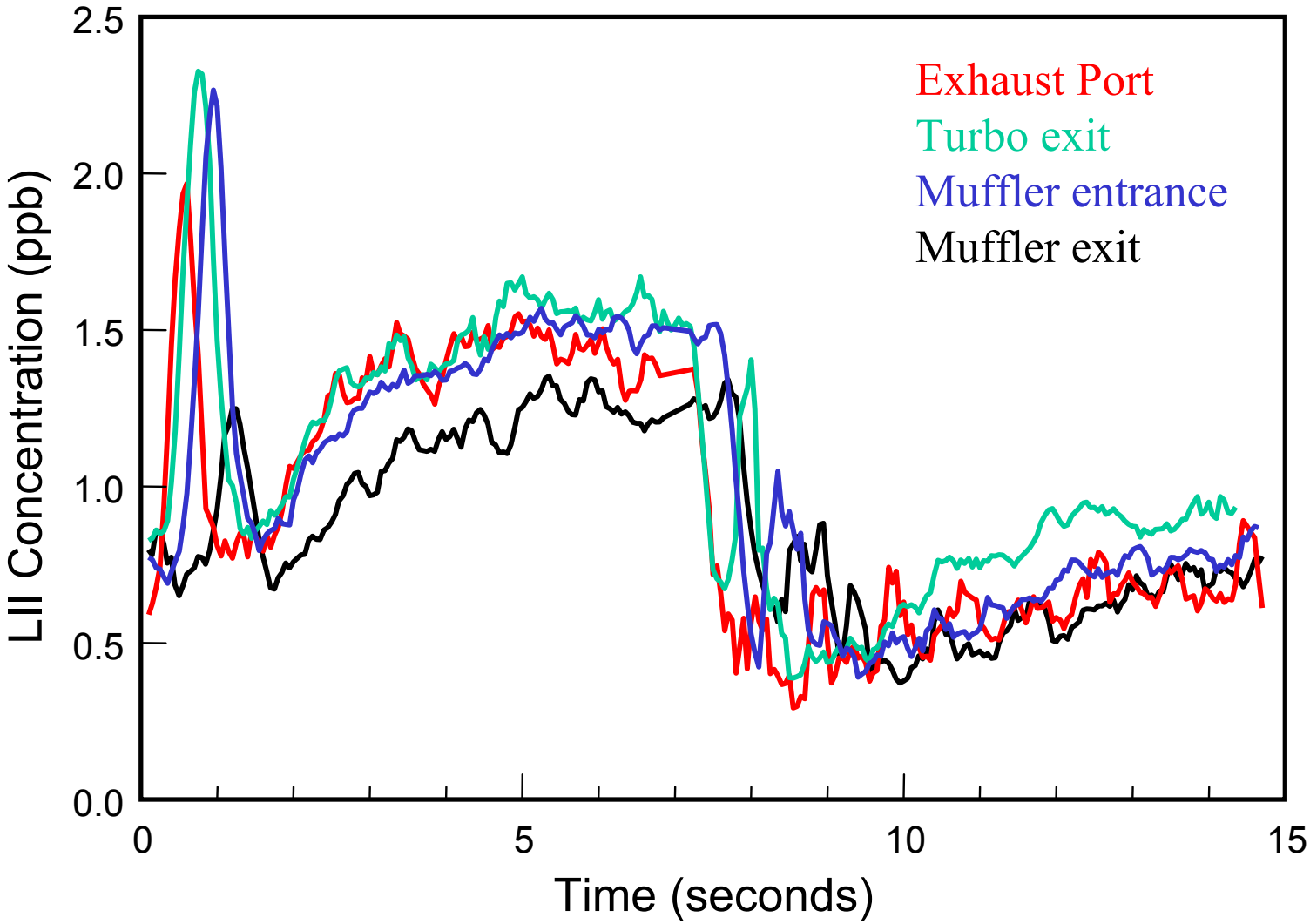
Entrance to DPF



1.9L TDI diesel engine

Effect of extraction location*

*Note muffler, not DPF



Conclusions about on-road LII

Is it feasible? Yes

Is it practical? Not yet

Why not? $$$$$$$$$$